

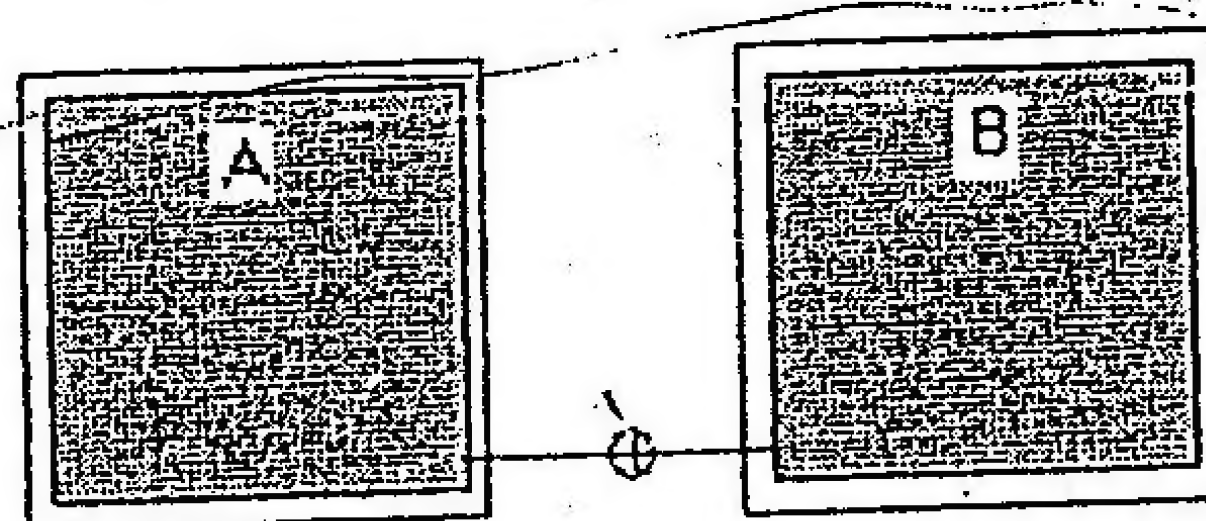


1: a- Complete the following table using thermodynamic tables: (6 marks)

substance	Tem. (°C)	Pressure (kpa)	Quality (x)	Specific Volume (v)	Internal energy (u)	Enthalpy (h)	Phase description
H ₂ O	140	361.3	0.194	0.10	969.21	1005.19	Saturated mixture liquid and vapor (two phase)
H ₂ O	300	1200	10.47	0.21382	2789.22	3153.59	Super heated Vapor
R-22	-10	150	2.51	0.16288	226.198	250.63	Super heated Vapor
Ammonia NH ₃	15	600	1.24	0.216345	1301.293	1431.1	Super heated Vapor

$$u = h - p v$$

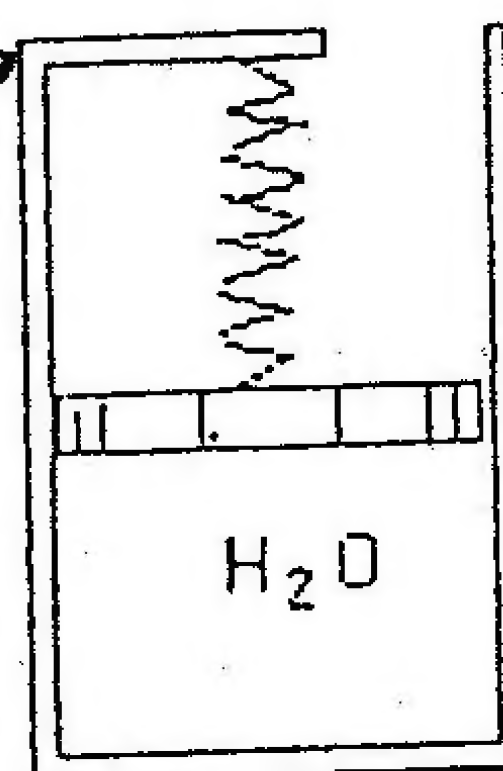
b- Two tanks are connected as shown, both containing water. Tank A is 300 Kpa, $v_A = 0.5 \text{ m}^3/\text{kg}$, $V_A = 1 \text{ m}^3$. Tank B contains 3.0 kg at 0.6 Mpa and 400 °C. The valve is now opened and the two tanks come to a uniform state. Find the final specific volume. (5 marks)



2: a- Air in a piston cylinder arrangement has a pressure that is related to the volume according to the equation $P = B + CV$ with C and B are constants. The initial state of the air $P = 150 \text{ Kpa}$, $V = 1 \text{ L}$ and the final state of $P = 800 \text{ Kpa}$ and $V = 1.5 \text{ L}$. Find the work done by the system. (6 marks)

b- A cylinder having a piston restrained by a linear spring contains 0.6 kg of saturated water mixture at 120 °C, $x = 0.20$ as shown in the Fig. Heat is transferred to the water, causing the piston to rise, and with a spring constant of 15 kN/m, piston cross-sectional area 0.05 m², the pressure varies linearly with volume until a final pressure of 500 kPa is reached. Find the final temperature in the cylinder and the heat transfer for the process. Show the P-V and T-V diagrams for the process. (8 marks)

تأثير رفع بواسطة
م. من أبو عيسى



ديناميكا حرارية
امتحان ثاني

Good luck

السودج الأول

$A = \checkmark$ (✓)
 $V = A^{\text{th}}$
 $P: \frac{V}{A} = \checkmark$

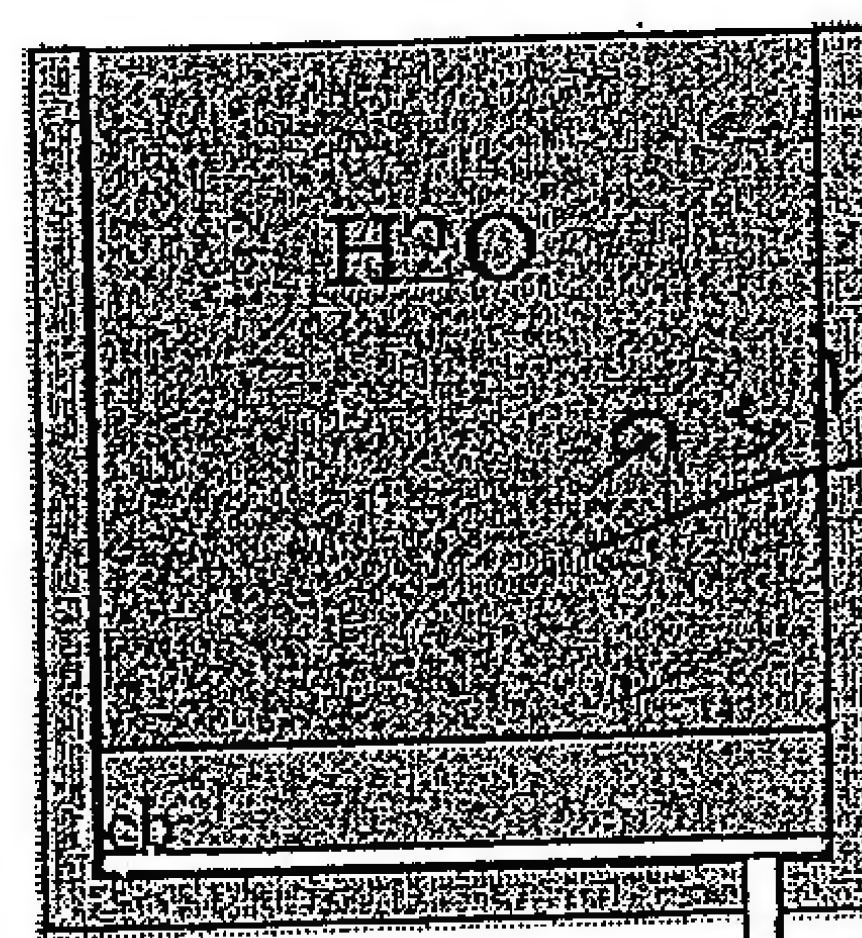
$$k \frac{DX}{A}$$

$$Dx = \frac{\Delta U}{A}$$

$$\frac{D.V.}{A.A.}$$

$$C_v = P(\Delta V)$$

$$V_p = p_0 +$$



$$\delta = \frac{1}{\sqrt{g}}$$

$$\omega_2 = \frac{1}{2} (158.4 + 161) \times 0.5$$

۴. رفع بواسطه ۴. معن ابو عیسی

$$\dot{Q} = \sum \sigma A L'$$

$$\dot{Q} = \sum \dot{Q}_A T_s$$

(4 marks)

1- Is the piston at the stops 2- the work in the process. 3- the heat transfer

assume the piston not stop of the stop

$$V_2 < (V_S)$$

From Stat 2

T_1, P_1 check

U

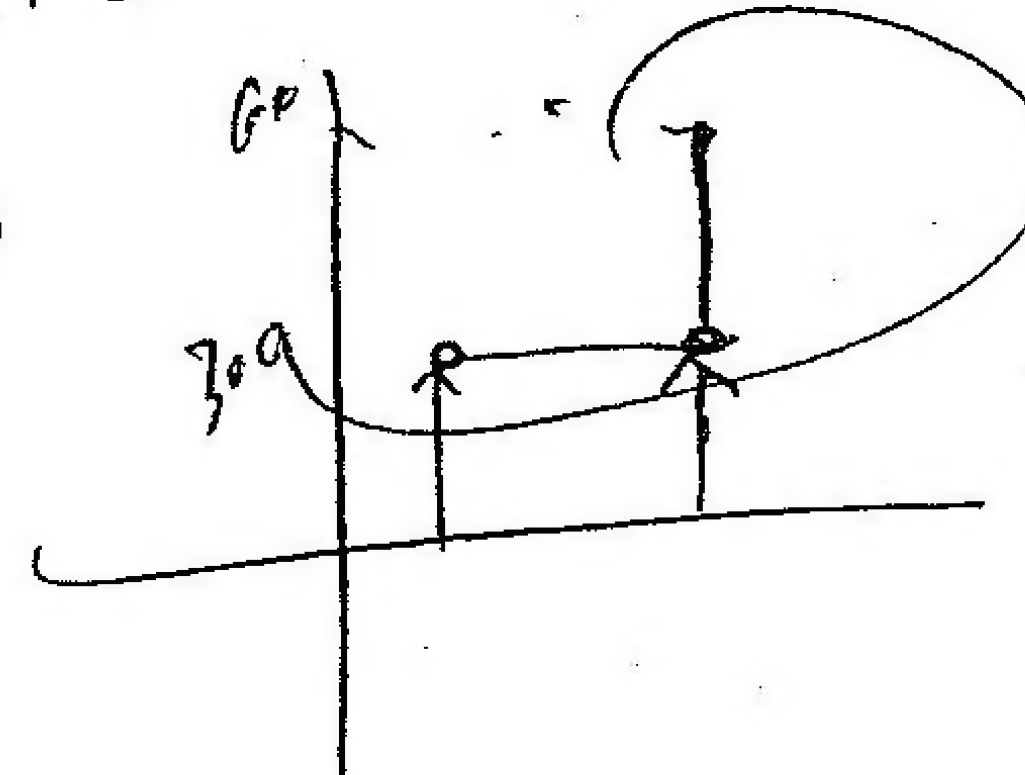
P2-S

25-139.6

$\frac{1}{2}$

$$\frac{17}{(u_2)}$$

Good luck

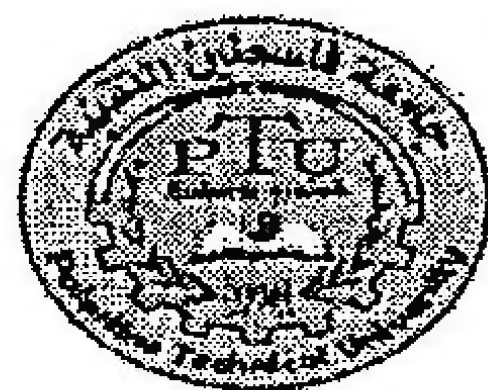


(9 marks)

3. Liquid water

دینا صیگا مراریت
امکان شای

المودج الثاني



Q1: (7 marks)

A rigid vessel contains 10 kg R-134 at a temperature -20°C and the volume of the vessel is 0.5 m^3 . Find the following:

- 1- The phase of the substance
- 2- The pressure
- 3- The specific volume
- 4- The total internal energy
- 5- The mass of the liquid phase if the substance is saturated mixture.

تم الرغج بواسطه
م. مهن ابو عيسى

ديناميكا حرارية
امكان ان
المؤدج مثال

Q2: a- (3 marks)

Define the following :

Isothermal process, Thermodynamic cycle, polytropic process

b- (4 marks)

what are the differences between conduction heat Transfer and convection heat transfer, write the equations used to calculate the rate of heat transfer in both.

Q3- (6 marks)

A gas initially at 1.0 MPa , 500°C is contained in a piston and cylinder arrangement with an initial volume of 0.1 m^3 . The gas is then slowly expanded according to the relation $PV = \text{constant}$ until a final pressure of 100 kPa is reached. Determine the work for this process and draw the P - V diagram for this process, assuming ideal gas behavior.

Q4- (10 marks)

A 2.0 kg Ammonia in a cylinder piston arrangement is at 700 kPa , 80°C (state 1). It is now cooled at constant pressure process to saturated vapor (state 2) at which point the piston is locked with a pin. The cooling process continues to -10°C (state 3).

Find:-

- 1- The final pressure
- 2- The work done on the system, ${}_1W_3$
- 3- Show the processes 1-2 and 2-3 on both a T - v and P - V diagrams.

